Soldier Mesa Tank Rotenone Treatment Plan

(August 19, 2013)

Arizona Game and Fish Department

5000 W. Carefree Highway

Phoenix, Arizona 85086

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ACKNOWLEDGEMENTS

Numerous people provided content, reviewed, and edited this piscicide project intermediate planning and public involvement proposal. Contributers included Julie Carter, Dave Weedman, Tony Robinson, Clayton Crowder, Chuck Benedict, Jeff Sorensen, Marianne Cox, and Matt Rinker.

SUGGESTED CITATION

AGFD (Arizona Game and Fish Department). 2013. Soldier Mesa Tank Rotenone Treatment Plan. Arizona Game and Fish Department, Phoenix.

Note: The Soldier Mesa treatment plan is an addendum to the overall Fossil Creek watershed treatment plan and associated paperwork completed in 2012, which included the treatment of stock tanks (including soldier mesa tank). Additional compliance and paperwork was completed specific to the Soldier Mesa Tank Treatment and to update existing paperwork to comply with ARS Title 17, Article 5, 17-481 and AGFD procedures and policies for piscicide treatments.

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1. PROJECT SUPERVISORS

PROJECT MANAGER/ADMINISTRATIVE LEAD/LEAD APPLICATOR

Scott Rogers
Arizona Game and Fish Department, Region 2
3500 S. Lake Mary Road
Flagstaff, AZ 86004
(928)-214-1245

Duties: Develop preliminary and intermediate plans and all necessary paperwork to implement project. Treatment Lead

Certifications: Arizona Department of Agriculture (ADA) Agricultural Commercial Pesticide Applicator Certification, Aquatic Applicator Certification

Training: AFS training--Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management

PISCICIDE APPLICATION CREW LEADS

Shaula Hedwall
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Southwest Forest Complex
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Duties: Spray Crew Lead

Certifications: ADA Agricultural Commercial Pesticide Applicator Certification, Aquatic Applicator Certification

Training: AFS training--Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management

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Duties: Spray Crew Lead

Certifications: ADA Agricultural Commercial Pesticide Applicator Certification, Aquatic Applicator Certification

Training: AFS training--Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management

2. PROJECT LOCATION

Fossil Creek drains a series of canyons and their tributaries originating on the Mogollon rim (Calf Pen Canyon, Sand Rock Canyon, Tin Can Draw, Mud Tanks Draw, Boulder Canyon, Cimarron Creek, and Sally May Wash). The treatment area includes Soldier Mesa Tank, Sandrock Tank, Sandrock Draw Tank, Mack's 1, and Mack's 2 (Figure 1). Currently, only Soldier Mesa is known to hold nonnative fish. These tanks are located on the Coconino National Forest and within the upper Fossil Creek watershed. Some of these tanks have been treated in the past to remove illegally introduced fish species and their maintenance must be part of any native fish management plan for the drainage. Periodic treatment of all tanks within the upper Fossil Creek watershed may be necessary to prevent unwanted nonnative species from inhabiting Fossil Creek.

The proposed treatment area of Soldier Mesa Tank is located on Soldier Mesa and where spilling drains into Sandrock Canyon (Figures 2 and 3, tributary of Fossil Creek). Soldier Mesa Tank is a ~0.30 acre pond within the Fossil Creek Drainage. Soldier Mesa Tank has been a problem area for illegal stocking of nonnative aquatic species (primarily tiger salamander and green sunfish). Stock tanks including Soldier Mesa Tank have been chemically treated to remove nonnative fish in previous years (2005, 2008, and 2009).

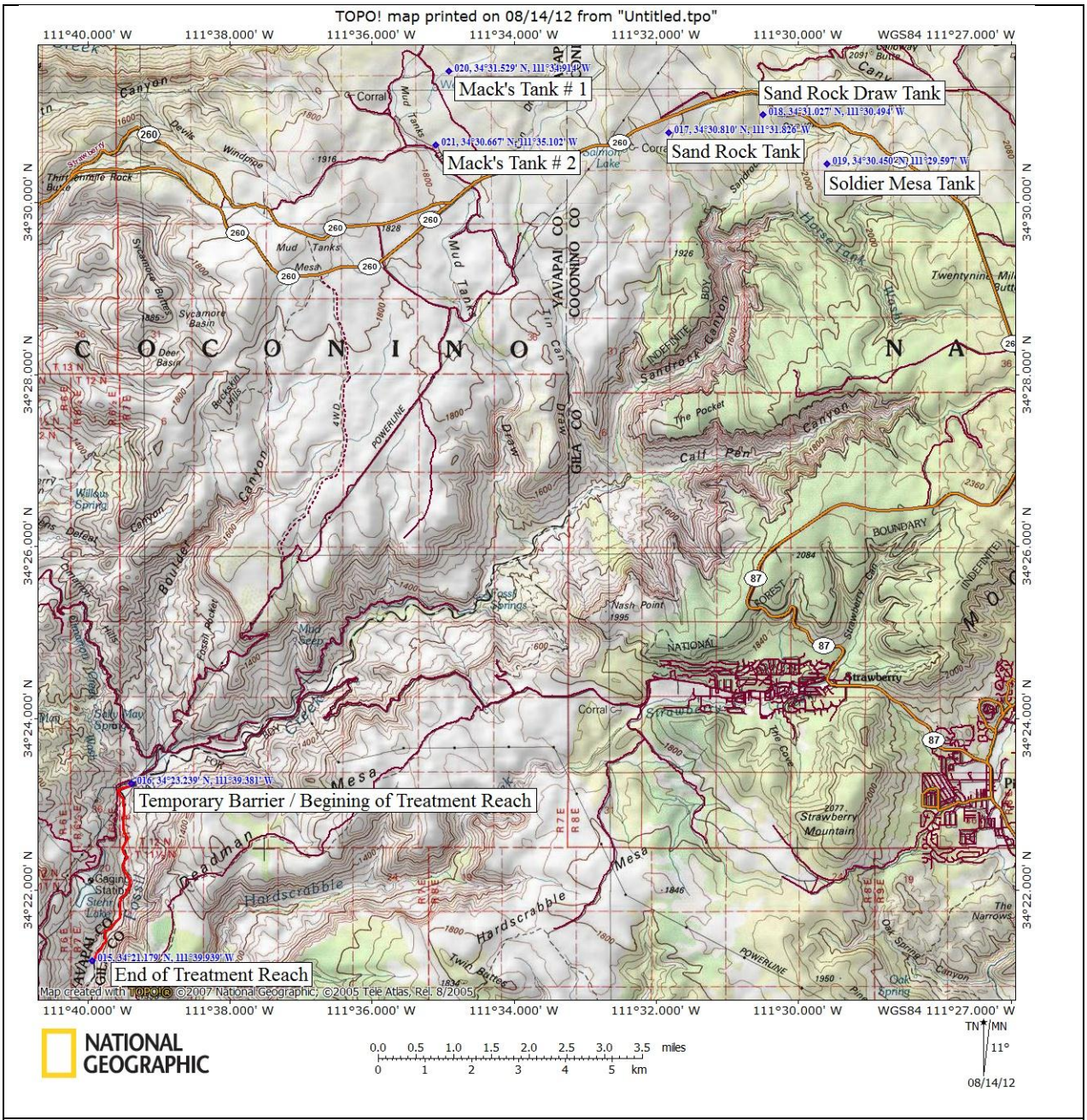

Figure 1: Treatment area of Fossil Creek when treated in 2012 (designated by red line) and known stock tanks within the Fossil Creek Drainage previously treated for nonnative fish and identified as potential illegal stocking locations.

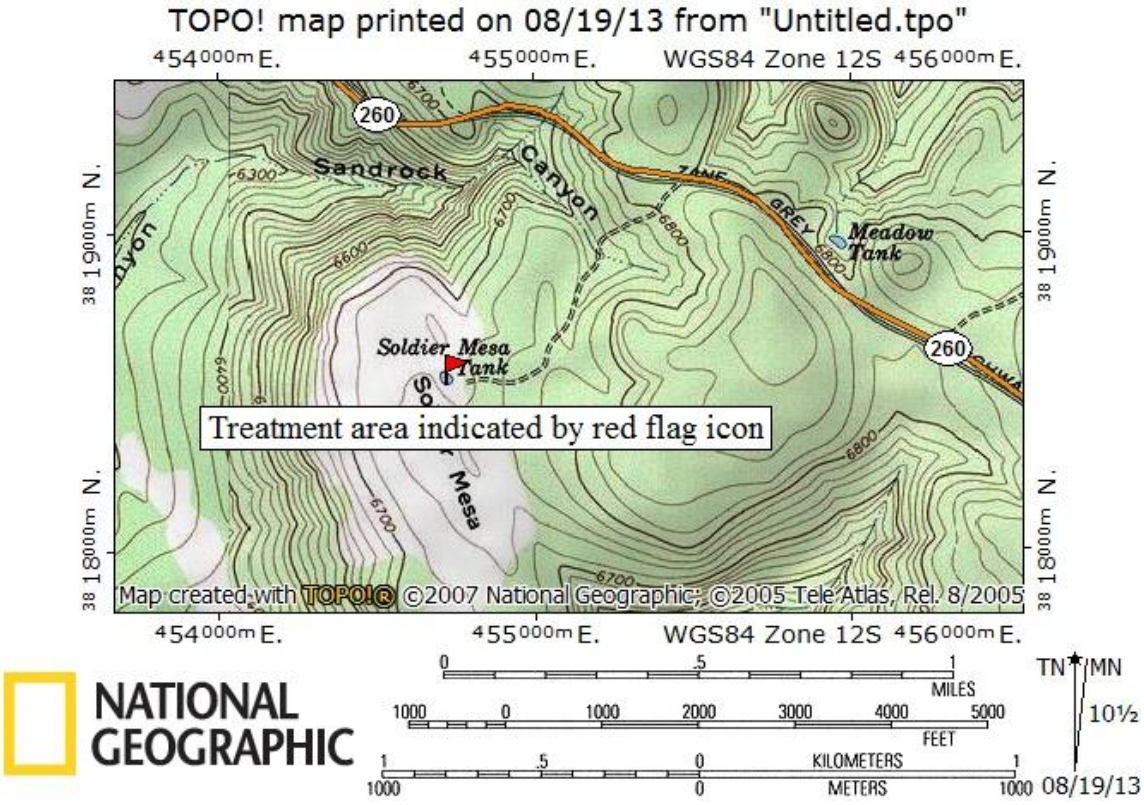

Figure 2. Treatment area designated by red flag icon.

Figure 3. Soldier Mesa Tank, August 2013.

LAND OWNERSHIP

Land management authority is with the Forest Service (USFS) (Coconino National Forest). Fish and wildlife are managed by Arizona Game and Fish Department (AGFD) and U.S. Fish and Wildlife Service (USFWS) in cooperation with the U.S. Forest Service.

3. PROJECT BACKGROUND

In September of 2012, piscicide was successfully applied to the lower 2.8 miles of Fossil Creek upstream of the fish barrier. Nonnative smallmouth bass were chemically removed from this area in order to protect this important native fishery.

The planning, public outreach and compliance for this chemical treatment was completed prior to September of 2012 and included the potential treatment of 5 reservoirs/tanks (Soldier Mesa Tank, Sand Rock Tank, Sand Rock Draw Tank, Mack's 1 Tank, Mack's 2 Tank) that are within the Fossil Creek watershed. The five tanks are identified as potential sources of nonnative aquatic species. One of the reservoirs (Soldier Mesa Tank) is known to contain nonnative green sunfish.

The rotenone treatment of Fossil Creek in 2012 came at a great cost to the department and its partners both in terms of dollars and human resources necessary complete the project. The presence of green sunfish in Soldier Mesa Tank jeopardizes the recent success of this project because runoff from this tank could distribute piscivorous nonnative fish back into area that was recently treated.

The passage of Senate Bill 1469 (ARS Title 17, Article 5, 17-481) requires additional steps to legally apply piscicides in the state of Arizona. The Fossil Creek treatment in 2012 was completed in adherence with the Department's Piscicide Treatment Planning and Procedures Manual, product label, and the Rotenone Standard Operating Procedures Manual. All elements of state and federal compliance including Title 17-481 have been met with the exception of the following: written Commission approval that the environmental analyses completed are sufficient to show no endangerment of humans, the environment, and livestock will occur when rotenone is applied; advance written notice to all owners, lessees and permittees; a published general notice in two publications in a daily or weekly newspaper in the general area in which the chemical will be applied; and water and soil analysis within the treatment area.

If approved by the Commission, the Department will proceed with completion of the remaining requirements of 17-481 as outlined above. The Department seeks to complete the remaining compliance, in accordance with the Department's Piscicide Treatment Planning and Procedures Manual, and schedule this treatment during the last week of September or first two weeks of October, 2013. It's important to treat Soldier Mesa Tank early in the fall because rotenone loses effectiveness in cooler water temperatures that would be encountered later in the fall and tends to persist longer at cold water temperatures.

INTENDED OUTCOME AND STATEMENT OF PURPOSE

The intended outcome of the proposed treatment is to remove nonnative fish from Soldier Mesa Tank within the Fossil Creek drainage. Our overall project objectives are: to apply CFT Legumine 5% (liquid rotenone) chemical fish toxicant to remove nonnative fish through treatment. We will meet these objectives while ensuring that our application of rotenone is limited to Soldier Mesa Tank, that we implement all necessary safety measures to protect staff, and practice leave not trace ethics throughout the project area.

PAST TREATMENT AND JUSTIFICATION FOR NEW TREATMENT

Several tanks in the watershed upstream of Fossil Creek were chemically treated with rotenone in 2005 (Divide Tank, Middle Tank, Black Tank, Mack's Tank #2, Soldier Mesa Tank an Antelope Tank). Soldier Mesa Tank was retreated in 2008 and again in 2009. In 2008, Sandrock Tank and Sandrock Draw Tank were also treated. These treatments were successful and the stock tanks listed above remained free of nonnative fish until green sunfish were detected in 2012. With no hydrologic connection to stock any stock tanks or waters upstream of Soldier Mesa Tank the presence of green sunfish in without question the result of illegal stocking activities. Green sunfish have been removed from this tank three times already, so the proposed treatment has a high probability for success. Success is defined as eradication of green sunfish

from Soldier Mesa Tank. Education and law enforcement will need to play an integral role if long term success is to be achieved (stock tanks to remain free of nonnative aquatic species).

4. PROJECT SPECIES

TARGET SPECIES FOR FISH REMOVAL

Green sunfish (*Lepomis cyanellus*) and other nonnative fish species within Soldier Mesa Tank.

NON-TARGET SPECIES WITHIN TREATMENT AREA

Non-target species will include primarily aquatic insects but may include other gill breathing organisms. Amphibians and aquatic reptiles in the treatment area include canyon treefrog (*Hyla arenicolor*), lowland leopard frog (*Rana yavapaiensis*), tiger salamanders (*Ambystoma tigrinum)* and gartersnakes (*Thamnophis spp.*).

See the 2012 AGFD Environmental Assessment Checklist (Appendix 1), 2004 AGFD Environmental Assessment Checklist Native Fish Restoration in Fossil Creek, and the USFS Native Fish Restoration in Fossil Creek Post-decisional (Section 18) Review for a list of species of concern in the project area.

5. MANAGEMENT OBJECTIVES AND RECOVERY PLANS

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012). Soldiers Mesa pond is not managed for fish.

6. PROJECT PARTNERS

Land management authority of the treatment area is by the Coconino National Forest. The U.S. Fish and Wildlife Service is an important cooperator on this project due to the importance of removing nonnative threats to native aquatic ecosystem that exists in Fossil Creek. Numerous stakeholder groups and fishing clubs including the Fossil Creek Stakeholder Group, the Native Fish Conservation Team, and the Northern Arizona Flycasters also share interest in this resource.

INTERAGENCY RESPONSIBILITIES

Arizona Game and Fish Department

Role: Action Agency, Oversight of the project, public outreach, pre-treatment fish surveys, fish salvage, chemical application, post-treatment monitoring

Contact Information: Scott Rogers (928)-214-1245

U.S. Fish and Wildlife Service, Arizona Ecological Services

Role: Endangered species compliance (NEPA)

Contact Information: Shaula Hedwall (928)-226-1289

USDA Forest Service, Coconino and Tonto National Forests

Role: Land management

Contact Information: Cecelia Overby (928)-527-3460

COOPERATOR MEETINGS HELD

For a complete list of cooperator meetings held See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012).

7. ALTERNATIVE METHODS EVALUATION

Green sunfish were one of the target species during the 2004 chemical treatment of the Fossil Creek. Green sunfish are detrimental to the survivorship of native fish species in flowing riverine systems. This reservoir is an important water source for wildlife and cattle. Pumping this tank dry is impractical because of the water demand in this area. Difficult road conditions make refilling the reservoir impossible. Mechanical removal efforts cannot guarantee a 100% removal of unwanted nonnative fish species. Mechanical removal of Green sunfish (young of the year) is rarely successful. More justification is described in the Environmental Assessment (Appendix 2).

8. PISCICIDE PROJECT INTERNAL REVIEW AND APPROVALS

See Appendixes for the Piscicide Internal Review and Approval Form (Appendix 3), the Piscicide Project Preliminary Treatment Plan (Appendix 4), the Piscicide Project Public Involvement Plan (Appendix 5), and the Piscicide Project Public Meetings Briefing (Appendix 6), and the Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (Appendix 7)(September 6, 2012 and amended August 27, 2013).

9. PISCICIDE APPLICATION PLAN

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER BODY

The treatment reach of Soldier Mesa Tank is characterized as a shallow (2.4 foot average depth), small (~0.30 surface acres), and muddy stock tank. The Tank is perched on Soldier Mesa and sits at an elevation of about 6,750 feet. Soldier Mesa Tank typically only spills after heavy snowpack and significant runoff events. When Soldier Mesa Tank does spill it flows into Sand Rock Canyon and then into the Headwaters of Fossil Creek. In the event that Soldier Mesa Tank is spilling on the scheduled date of the treatment the treatment will be postponed until conditions are appropriate to keep the treatment within the treatment area. Water conditions are very muddy as the tank is used as a water source by cattle and wildlife. Heavy aquatic vegetation is not uncommon in the tank with maximum plant growth achieved in the summer time.

PROTOCOLS AND MONITORING PLAN FOR GROUNDWATER OR SURFACE WATER

Soldier Mesa Tank is not used for drinking water and has no hydrologic connections to wells. The testing of water and soil from the treatment area will be tested according to the methods outlined in Finlayson et al. (2010) as required by the ARIZONA GAME AND FISH DEPARTMENT PISCICIDE TREATMENT PLANNING AND PROCEDURES MANUAL May 25, 2012 and Title 17-481. Water and soil from within the treatment area will be sampled and submitted to a lab for analysis. Water and soil samples will be collected before, halfway through the initiation of the treatment and no earlier than 24 hours after the end of the treatment activities. Given the guidance from the Rotenone SOP Manual (Finlayson et al. 2010) for standing water, appropriate signage will be posted 1 day prior to treatment and application sites posted at time of application. Treatment rates will depend on the results of a bioassay, however given the small size of the tank and the target species involved the rotenone treatment label suggests 0.5-1ppm 5% active ingredient formulation for normal pond applications and 2.0-4.0 for organic ponds. The previous three treatments of Soldier Mesa Tank were implemented at 1ppm of 5% active ingredient formulation (2005, 2008, and 2009). Depending on the results of the bioassay one of the two approaches regarding the removal of signs will be implemented.

1. For both lotic (flowing water) and lentic (standing water) applications of $\leq$0.09 ppm (90 ppb) active rotenone ($\leq$1.8 ppm 5% a.i. formulation), signs can be removed once application is complete.

2. For standing water applications >0.09 ppm active rotenone (>1.8 ppm 5% a.i. formulation), signs can be removed following a 24-h bioassay demonstrating survival of bioassay fish, or when analytical chemistry shows $\leq$0.09 ppm active rotenone, or 14 days after the application is complete, whichever is less.

Waters treated with rotenone and used for drinking or with hydrologic connections to wells, when application rate is >40 ppb (>0.04 ppm) rotenone, require the user to be advised against the consumption of water until: (1) active rotenone is <0.04 ppm as determined by analytical chemistry, or (2) fish of the Salmonidae or Centrarchidae families can survive for 24 hours, or (3) dilution with treated water yields a calculation that active rotenone is <0.04 ppm, or (4) distance or travel-time from the application site are known to produce an active rotenone concentration that is <0.04 ppm.

LOGISTICS, METHODS OF OPERATION, AND PRELIMINARY SCHEDULE

Pre-Implementation Coordination

- Contact Coconino National Forest and of treatment dates (10) days prior to treatment activities.
- Contact Partners – U.S. Fish and Wildlife Service (Shaula Hedwall), Coconino National Forest.

Additional Steps per Title 17-481

- Supply two media sources with information about the upcoming treatment (Payson and Camp Verde).
- Inform current permitee of treatment dates (10) days prior to treatment activities.

Contingency Planning

1. **Weather:** In the event that precipitation may affect the success of the treatment or cause the tank to spill out of the treatment area the treatment will be postponed/rescheduled until conditions are suitable for treatment activities. Weather will be monitored daily up to and through the expected treatment date(s). If the weather report changes, (e.g., Pacific hurricane possibility or monsoon patter does not end), the treatment lead will make a decision whether to initiate the chemical treatment based upon the current and five-day forecasts.

2. **Public Outreach:** adequate public outreach occurred during the 2012 treatment of Fossil Creek informing the public of chemical treatment activities within the Fossil Creek Watershed per the AGFD Piscicide Treatment Planning and Procedures Manual May 25, 2012. In addition the announcement of treatment activities at Soldier Mesa Tank will be provided to two newspapers: the Payson Roundup and The Verde Independent per current legislation. Informative signs will be place on each road that accesses the tank closing the area to public and informing the public of the project.

3. **Failure of the neutralization operation (i.e., killing fish outside the treatment area):** Soldier Mesa Tank is perched upon Soldier Mesa and typically only spills after heavy snowpack and significant runoff events. When Soldier Mesa Tank does spill it flows into Sand Rock Canyon and then into the Headwaters of Fossil Creek. In the event that Soldier Mesa Tank is spilling on the scheduled date of the treatment the treatment will be postponed until conditions are appropriate to keep the treatment within the treatment area.

4. **Failure of the treatment to accomplish the stated objectives:** We will follow the action identified in the EA to remove nonnative fish and monitor our success. The Project Leads are confident that monitoring has been designed to identify whether we meet our project objectives or not (e.g., unable to get complete removal of fish during chemical application, illegal stocking later in time). However, regardless of whether this project is immediately successful or not, tracking exactly how the project was implemented and following our monitoring plan will inform future nonnative fish removal projects in Soldier Mesa Tank.

5. **Significant Injury (see Site Safety Plan):** Immediate first aid will be rendered. Complete first aid kits and people who know how to use them as well as CPR certified staff will be present. Depending upon the severity of the incident one to two people will be assigned to care for injured party and arrange transport for them to Verde Valley

Medical Center if necessary. If for some reason AGFD radios do not work to radio for help, cellular phone coverage is good at Soldier Mesa Tank.

Equipment Needs

Monitoring

- 15 ft straight seine
- 50 ft bag seine
- Dip nets
- Waders and boots
- Disinfection station (quaternary ammonia spray bottle, scrub brush)

Chemical Treatment

- Rotenone (amount to be determined by volume measurements)
- Potassium/Sodium permanganate (AGFD Region 2, Flagstaff)
- Dispensers for detoxicant (1)
- Measuring cups/old Nalgenes for chemical dilution
- Backpack sprayers (2)
- Respirators (5)
- Surgical gloves (1 box large, 1 box medium)
- Rubber Gloves
- Staple gun (for posting signs)
- Live cars
- Wash stations (set up at parking area of Soldier Mesa Tank)
- Waders (bring your own)
- Camera
- Tool kit (AGFD, FWS)
- First Aid Kit and Eye wash station.

Bioassay

Bioassays are necessary to calculate the minimum effective dose (MED) of piscicide for the target species within the treatment area. Bioassays are also a legal requirement as per the CFT Legumine label. Laboratory and/or on-site bioassays will be completed upon commission approval of the proposed project. Green sunfish from Soldier Mesa Tank will be collected and placed into each of six aquaria (each with a different concentration of rotenone) that contained 40 liters of Soldier Mesa Tank water, and held for 4 hours. Water in the tanks will be kept at ambient room temperature, and water quality parameters will be recorded (temperature, pH, dissolved oxygen, and hardness). Results of the bioassay will be included in the final treatment report.

PISCICIDE AND NEUTRALIZATION FORMULATION

Given the guidance from the Rotenone SOP Manual (SOP 7.0, Finlayson et al. 2010), no deactivation is necessary.

I. Need for Deactivation:

Rotenone treated water is deactivated to minimize exposure to non-target organisms beyond (e.g. downstream) the Treatment Area, unless determined "unnecessary" by the Certified Applicator. Guidance on the necessity of deactivation is explained below through examples where deactivation is considered "necessary" and "unnecessary." The Project Area includes the Treatment Area and the deactivation zone, if used (see SOP 6, Finlayson et al. 2010).

A. Necessity and Feasibility of Deactivation. If rotenone-treated discharge affects non-target species beyond the margins of the Treatment Area (see SOP 6.0 for definition, Finlayson et al. 2010), then it is necessary to deactivate the discharge unless:

1. If there is no discharge from the Treatment Area or the discharge goes dry in a distance shorter than 2 miles or 2 hours travel-time (maximum distance/time between drip stations recommended on label) from the lowest drip station or discharge, then it is unnecessary to deactivate the discharge. Examples include ponds or lakes with no discharge or a stream that goes dry (i.e., underground) a short distance (within 2 miles) from the Treatment Area.

2. If there are physical limitations that prohibit the operation of deactivation equipment, then it is unfeasible to deactivate the discharge. Examples include a stream where treated water flows into a canyon or chasm and access to the stream is difficult or safety is an issue. In such situations, the Certified Applicator through bioassay or analytical testing assures that the discharge is no longer toxic at 30 minutes travel time downstream of where the stream emerges at an accessible location and deactivation could be accomplished.

CFT Legumine will be the primary toxicant utilized in this proposed treatment. The target concentration of CFT Legumine will be determined based on the results of the bioassay and will follow the Rotenone SOP Manual (Finlayson et al. 2010) and CFT Legumine ^{TM} label (Figures 4, 5, and 6).

TABLE SOP 5.1. Recommended rotenone treatment concentrations and number of acre-feet (AF) standing water covered by one gallon or one pound of (5% a.i.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		AF per Gallon Liquid	AF per Pound Powder
	Product (5% a.i.)	Active Rotenone		
Normal	0.5–1.0	0.025–0.05	6.0 to 3.0	0.74 to 0.37
Tolerant Species	1.0–3.0	0.05–0.15	3.0 to 1.0	0.37 to 0.123
Tolerant Species in Organic Ponds	2.0 – 4.0	0.1 – 0.2	1.5 to 0.75	0.185 to 0.093

Figure 4. Table from Planning and Standard Operating Procedure for the Use of Rotenone in Fish Management, Rotenone SOP Manual (Finlayson et al. 2010).

TABLE SOP 5.2. Recommended rotenone treatment concentrations and number of cubic meters (m^3) standing water covered by one liter or kilogram of (5% a.i.) product. Adjust amount of product according to the actual rotenone content on Ingredient Statement on label.

Type of Use	Parts per Million (ppm)		m^3 per Liter Liquid	m^3 per Kilogram Powder
	Product (5% a.i.)	Active Rotenone		
Normal	0.5–1.0	0.025–0.05	2000 to 1000	2000 to 1000
Tolerant Species	1.0–3.0	0.05–0.15	1000 to 333	1000 to 333
Tolerant Species in Organic Ponds	2.0–4.0	0.1–0.2	500 to 250	500 to 250

Figure 5. Table from Planning and Standard Operating Procedure for the Use of Rotenone in Fish Management, Rotenone SOP Manual (Finlayson et al. 2010).

VOLUME CALCULATIONS

Directions for Use from CFT Legumine™ Label.

FOR USE IN PONDS, LAKES, AND RESERVOIRS

The actual application rates and concentrations of rotenone needed to control fish will vary widely, depending on the type of use (e.g., selective treatment, normal pond use, etc.) and the factors listed above. The table below is a general guide for the proper rates and concentrations. This product disperses readily in water both laterally and vertically, and will penetrate below the thermocline in thermally stratified bodies of water.

Computation of Acre-Feet: An acre-foot is a unit of volume of a body of water having the area of one acre and the depth of one foot. To determine acre-feet in a given body of water, make a series of transects across the body of water taking depths with a measured pole or weighted line. Add the soundings and divide by the number made to determine the average depth. Multiply this average depth by the total surface area in order to determine the acre-feet to be treated. If number of surface acres is unknown, contact your local Soil Conservation Service, which can determine this from aerial photographs.

Amount of CFT Legumine Needed for Specific Uses: To determine the approximate number of gallons needed, find your "Type of Use" in the first column of the table below and then divide the corresponding numbers in the fourth column, "Number of Acre-Feet Covered by One Gallon" into the number of acre-feet in your body of water.

Type of Use	Parts per Million		Number of Acre-Feet Covered by One Gallon
	CFT Legumine	Active Rotenone	
Selective Treatment	0.10 to 0.13	0.005 to 0.007	30 to 24
Normal Pond Use	0.5 to 1.0	0.025 to 0.050	6.0 to 3.0
Remove Bullheads or Carp	1.0 to 2.0	0.050 to 0.100	3.0 to 1.5
Remove Bullheads or Carp in Rich Organic Ponds	2.0 to 4.0	0.100	1.5 to 0.75
Preimpoundment Treatment Above Dam	3.0 to 5.0	0.150 to 0.250	1.0 to 0.60

*Adapted from Kinney, Edward. 1965. Rotenone in Fish Pond Management. USDI Washington, DC Leaflet FL-576

Pre-Mixing and Method of Application: Pre-mix with water at a rate of one gallon of CFT Legumine to 10 gallons of water. Uniformly apply over water surface or bubble through underwater lines.

Figure 6. CFT Legumine™ Label with instructions of specific concentrations and uses based on type of use.

Methods of Rotenone Application

Sprayers

The backpack spray crew leaders will be: Scott Rogers, Shaula Hedwall, and Matt Rinker. Scott Rogers will lead the chemical application. Verbal communication will be adequate since the pond is only 0.30 surface acres.

CFT Legumine™ will be applied at a dosage sufficient to kill green sunfish based on the results of the bioassay. The treatment will consist of backpack sprayers moving along the shorelines and in the shallow areas as well as sprayers in boats using electric motors and/or oars to mix CFT Legumine™ into the water column. Backpack sprayers will generally try to minimize stirring up the bottom sediment which can diminish chemical effectiveness. The first sign of fish distress and rising to the surface will be noted.

A minimum of two people (in case an injury or medical emergency is sustained) is required to successfully treat Soldier Mesa Tank, but as many as six individuals may be used for the treatment (one treatment/medical lead, One person to collect water and soil samples, one person to operate the boat, one person to spray from the boat and two people to spray from shore).

Rotenone concentrate will be diluted (1 to 2 % solution, AFS SOP 12.0) on site using the following procedure. Crew members wearing the appropriate PPE (goggles, gloves, cartridge style respirators, long sleeves etc) will fill their sprayers ½ way with strained water from the Tank. Concentrate rotenone will then be added to the sprayer using a graduated cylinder at the appropriate amount to reach the desired concentration. The sprayer will then be completely filled with strained Tank water. Once the lid to the sprayer is securely fastened, gentle agitation of the sprayer in a circular motion for ~ 30 seconds will adequately mix the solution. Each crew member will keep a log of the amount of concentrate chemical used and number of times the sprayer was filled.

Timing of Application

Treatment will occur during late summer to early fall, late enough that green sunfish spawning will have already occurred and eggs have already hatched but early enough that water temperatures are warm enough to use minimal amounts of chemical. . Preferred treatment dates are in late September and early October.

Required Permits and Approval

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013) for a list of permits and approvals.

Biological and Chemical Monitoring Required

Fish behavior will be monitored during and after the treatment to document the rate of rotenone effect and overall success of the treatment. General fish behavior will include:

- Tipping – when fish begin to lose their equilibrium,
- Gilling - when fish have lost equilibrium and respiration becomes difficult,
- Death.

The times of the observed behaviors and the number of individuals observed displaying them will be recorded. Crew members will record the above mentioned behaviors of fish within the treatment reach. All information will be communicated to the lead applicator hourly and application rates will be adjusted accordingly.

Rotenone concentrations will also be monitored according to the procedures described above under Protocols and Monitoring of Groundwater or Surface water.

Sampling and Treatment Tentative Dates

Treatment – The ideal timeframe for the proposed treatment of Soldier Mesa Tank is during the last week of September, 2013 or the first two weeks of October, 2013 with the first treatment scheduled early enough that if the original treatment was unsuccessful (post monitoring to confirm an unsuccessful treatment) a second treatment can be accomplished within the allotted time frame. All efforts will be made to schedule treatment activities when big game hunts are not open to minimize the potential for human entry into the treatment area and not to limit hunter opportunity. Preferred treatment dates are September 27th, 2013 – October 3rd, 2013 (this is the time frame when no big game hunts are scheduled in GMU 6A). Early treatment dates also increase the effectiveness of the rotenone (rotenone works better at warmer temperatures) and shortens the time that rotenone persists in the reservoir.

Monitoring – will occur after the initial treatment to confirm success of the treatment and if need be after subsequent treatments if the original treatment was unsuccessful.

10. SITE SAFETY PLAN

All employees involved in the rotenone application will receive safety training and hazard briefing as described below. Scott Rogers (AGFD), Shaula Hedwall (USFWS), and Matt Rinker (AGFD) will be responsible for providing the training and hazard briefings. Safety briefings will be given to treatment crews on site at the beginning of each day of treatment prior to any treatment activities. Material Safety Data Sheets (MSDS; Appendix 7) sheets, label, emergency first aid and evacuation site locations and map will be distributed at that time to the entire crew. All AGFD employees handling CFT legumine and potassium permanganate will be required to

complete OSHA medical evaluation questionnaires (Appendix 9) and take the OSHA respirator fit test to be cleared for proper respirator use. Fit test will be conducted on-site by a licensed physician (Concentra). AGFD employees that will be conducting the Soldier Mesa Tank treatment have already completed the OSHA questionnaire and have been fit tested by a licensed physician (Concentra).

SAFETY TRAINING

All Employees involved in the rotenone application will receive rotenone safety training on-site. All crew leaders will be Certified Applicators having completed the necessary safety training associated with the certification process. All certified applicators will provide a copy of their current applicator certificate prior to treatment activities to be held on record by the project lead (Scott Rogers). On-site training will be given by the treatment lead covering the Chemical label, MSDS sheets, where eye wash stations; first aid; and emergency vehicle and pedestrian sites are located, how to properly use Rotenone and application equipment, and PPE and it proper use. Upon receiving proof of certification and training all members of the treatment crew will fill out the certification record to show that they have complete the necessary training requirements.

COMPREHENSIVE HAZARD COMMUNICATION BRIEFING

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

SPILL CONTINGENCY PLAN

Background

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013) for background information.

Inventory of Materials Used During Treatment

- Rotenone: CFT Legumine™ Fish Toxicant
    - Staging Area: Main Camp at Stehr Lake (up to 30 gallons)
    - Treatment Areas: Upper Drip (up to 12 Gallons), Middle Drip (up to 6 gallons), Lower Drip (up to 6 gallons), Upper spray reach (up to 1 gallon), Middle spray reach (up to ½ gallon).

Description of Storage Areas

- The storage of Rotenone will be stored on-site at Soldier Mesa Tank only during the duration of the treatment. No Rotenone will be stored overnight and all chemicals and equipment will be transported offsite once treatment activities are completed. Storage will occur in accordance of the chemical label. Plastic spill containment devices, in a

shaded area, covered with a tarp. A certified applicator will be on site 24 hours a day during the duration of the treatment.

Description of Staging Areas, Mixing Areas, Treatment Areas, and Deactivation Areas

- *Staging Areas* – The staging area will be Soldier Mesa Tank, all activities will occur next to the tank.
- *Mixing Areas* – Mixing area will be Soldier Mesa Tank, all chemical will be mixed on site just prior to treatment activities.
- *Treatment Areas* – The treatment area will include all of Soldier Mesa Tank.

Precautions Specific to Site, Locale, and Treatment

- Liquid formulations will be stored upright with lids securely attached prior to use.
- On site chemical will be kept in canisters with lids.
- Constant monitoring of flows will occur to insure no major increases in stream flows occur during active dripping.
- Access to drips and deactivation stations will be in remote locations and will be closed to the public.

Chain of Command

- In the event that a spill occurs the chain of command will be as follows:

    1. Crew Leader

    2. Treatment/Project Lead (Scott Rogers)

    3. PIO/Organization spokesperson (Tom Cadden (AGFD), Connie Birkland (USFS), Jeff Humphrey (USFWS)): If the spill is large in scale and potential for bad press is a possibility.

    4. EPA – If the spill is significant enough that specially trained professionals need to clean it up. *See Crisis Management Plan and PDMP*.

Contact Information of All Entities That Must be Contacted in the Event of a Reportable Spill

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013) Crisis Management Plan for a list of contacts.

Specific Spill Containment and Recovery Procedures

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

Mode of communication:

- The main mode of communication will be verbal as Soldier Mesa Tank is a small (.33 acre) pond. In the event of an emergency cellular phones or AGFD radios will be used.

Area Map:

The map below shows the treatment area, emergency areas, chemical storage and evacuation route.

- Emergency areas are shown by a red cross including eyewash stations, first aid kits, vehicle parking, road access and walk out access.
    1. *Eye wash sites* – are those areas with clean water strictly for flushing of eye in the case of chemical to eye contact.
    2. *Emergency Walk-out locations* – are those areas where walking out of the treatment area to a road way is feasible in case of an emergency

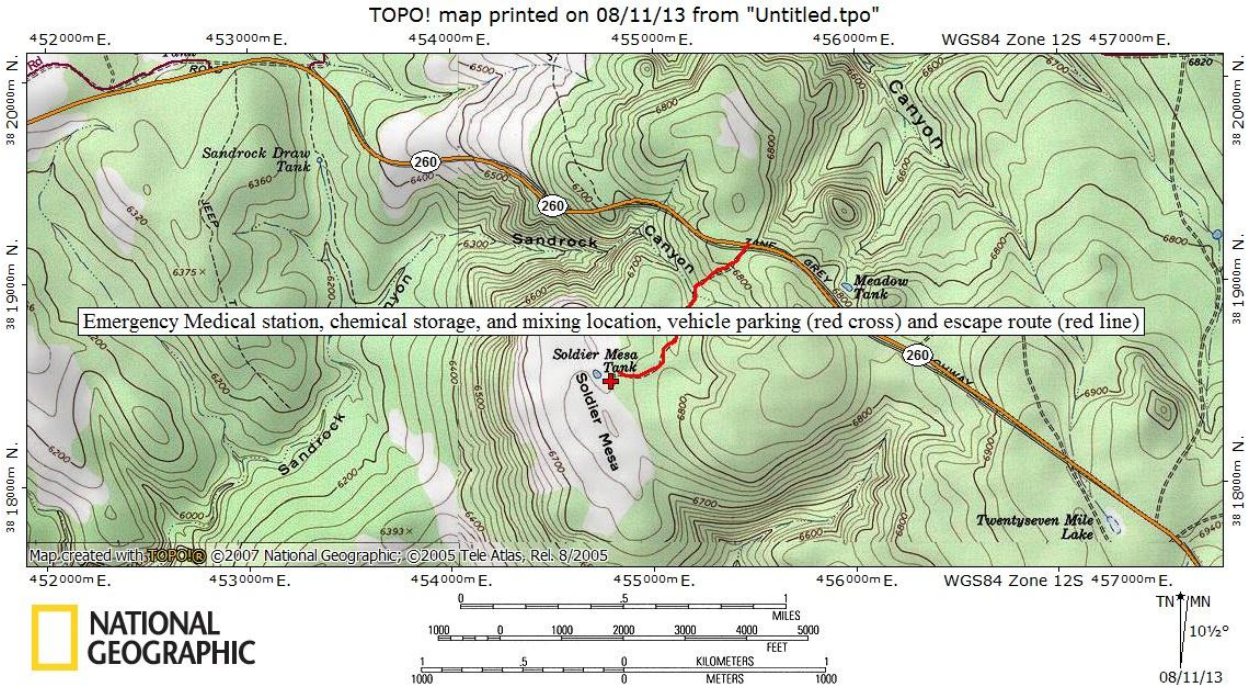

Figure 7. Location of First Aid, Chemical Storage during the treatment, mixing location, and Emergency Escape Route.

Transportation of Rotenone and Potassium Permanganate

Rotenone (CFT Legumine) and $KMnO_4$ will be transported from AGFD offices in Flagstaff to Soldier Mesa Tank in truck beds. Rotenone containers will be placed in a spill container, covered with a tarp, and secured in the bed of a truck. Hazardous materials (HAZMAT) vehicle placards (POISON for Rotenone) will be attached to each end and side of the tarp, and shipping papers, spill kits, emergency response phone numbers, and product MSDS will be present in the trucks that transport the chemicals.

After arrival at Soldier Mesa Tank, rotenone will be stored as described above (Description of Storage Areas).

11. COMMUNICATIONS AND SITE SECURITY PLAN

The purpose of the communications and site security plan are to mitigate for human recreational exposure to rotenone and to provide an operating protocol for public notification of treatment area restrictions prior to, during, and following application of rotenone. Information relative to water quality monitoring and notifications is also included. Soldier Mesa Tank is not used for drinking water and has no hydrologic connections to wells. The testing of water and soil from the treatment area will be tested according to the methods outlined in Finlayson et al. (2010) as required by the ARIZONA GAME AND FISH DEPARTMENT PISCICIDE TREATMENT PLANNING AND PROCEDURES MANUAL May 25, 2012 and Title 17-481. Water and soil from within the treatment area will be sampled and submitted to a lab for analysis. Water and soil samples will be collected before, 4 hours after the initiation of the treatment and no earlier than 24 hours after the end of the treatment activities. Based on the Rotenone SOP Manual (Finlayson et al. 2010), guidance on public re-entry is based on the treatment rates used during the treatment (determined by bioassay). Given the small size of the tank and the target species involved the rotenone treatment label suggests 0.5-1ppm 5% active ingredient formulation for normal pond applications and 2.0-4.0 for organic ponds. The previous three treatments of Soldier Mesa Tank were implemented at 1ppm of 5% active ingredient formulation (2005, 2008, and 2009). Depending on the results of the bioassay one of the two approaches regarding the removal of signs and subsequently public entry will be implemented.

1. For both lotic (flowing water) and lentic (standing water) applications of $\leq$0.09 ppm (90 ppb) active rotenone ($\leq$1.8 ppm 5% a.i. formulation), signs can be removed once application is complete.

2. For standing water applications >0.09 ppm active rotenone (>1.8 ppm 5% a.i. formulation), signs can be removed following a 24-h bioassay demonstrating survival of bioassay fish, or when analytical chemistry shows $\leq$0.09 ppm active rotenone, or 14 days after the application is complete, whichever is less.

Waters treated with rotenone and used for drinking or with hydrologic connections to wells, when application rate is >40 ppb (>0.04 ppm) rotenone, require the user to be advised against the consumption of water until: (1) active rotenone is <0.04 ppm as determined by analytical chemistry, or (2) fish of the Salmonidae or Centrarchidae families can survive for 24 hours, or (3) dilution with treated water yields a calculation that active rotenone is <0.04 ppm, or (4) distance or travel-time from the application site are known to produce an active rotenone concentration that is <0.04 ppm.

PRESS RELEASE

Pre-closure Press Release

The announcement of the treatment of Soldier Mesa Tank will be provided to two local newspapers (Verde Independent and Payson Roundup) at least 10 days prior to the scheduled treatment. A media release will also be published online by the Arizona Game and Fish Department.

POSTING OF CLOSURE INFORMATION

Locations

Appropriate signage describing the area closures and chemical treatments will be placed along the treatment area and at all public access points.

1. *Soldier Mesa Tank*: A) At the tank itself posted in the four cardinal direction on each side of the tank
2. *Roads*: A) All Forest Service Road access from Highway 260 to the tank.

Signs

The following information will be placed on the placards (signs):

- DANGER/PELIGRO
- DO NOT ENTER WATER/NO ENTRE AGUA: Pesticide Application
- Rotenone CFT Legumine™ 5% is being used to remove nonnative fish from Soldier Mesa Tank.
- The start date of the treatment
- The end date of the treatment
- Recreational access (e.g., wading, swimming, boating, fishing, etc.) within the treatment area is prohibited while rotenone is being applied.
- Do not swim or wade in treated water while placard is displayed.
- Do not consume dead fish from treated water.
- For more information contact: Fossil Creek hotline at 928-226-4611, Red Rock Ranger District at 928-203-2900, Arizona Game and Fish Department 928-774-5045, or go to www.coconinoforest.us

ON-SITE COMMUNICATIONS

Mode of On-site Communications

Verbal command will be the main mode of communications for the treatment. In the case of emergency cellular phones and/or AGFD radios will be the primary mode of on-site communications.

General Communications Chain of Command

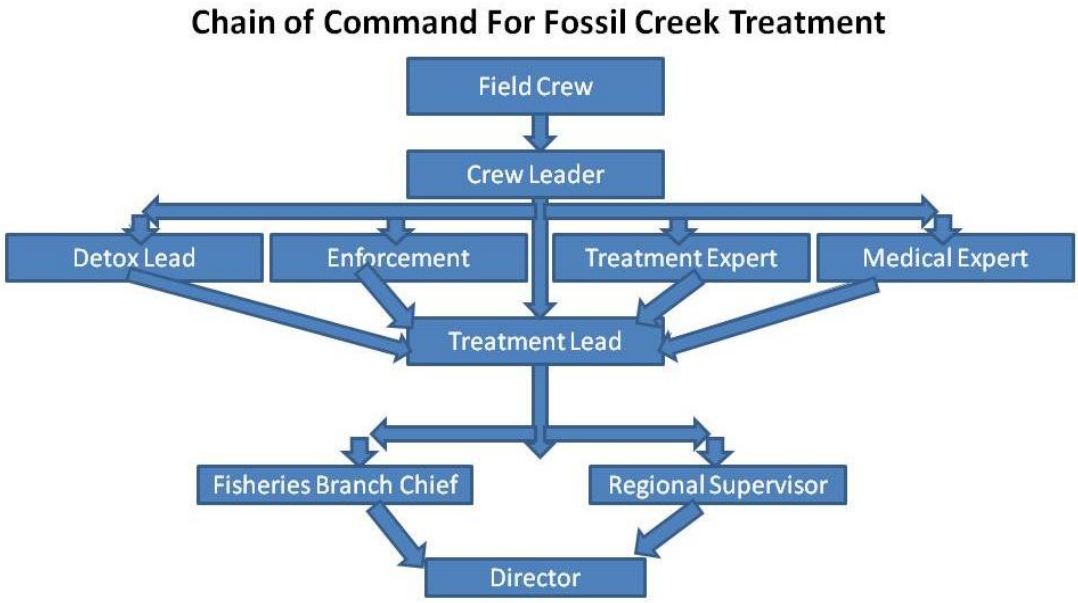

Figure 8. Chain of command for treatment activities euring chemical treatments.

The field crew, crew leaders, and treatment lead will communicate as needed to safely and effectively carry out the Fossil Creek treatment.

Treatment Lead – Scott Rogers (AGFD)
Spray Crew Leads – Shaula Hedwall (AGFD), Matt Rinker (AGFD)

For emergency communications (e.g., injury, chemical spill, flash flood, etc) see Crisis Management Plan.

SITE SECURITY

In accordance with the Rotenone SOP Manual (Finlayson et al. 2010), appropriate signage will be in place one day prior to treatment activities at all access sites and at the treatment site itself. Signs will remain until the treatment is completed and is deemed safe for public access. Treatment Staff will be onsite during the duration of the treatment.

12. FISH REMOVAL AND DISPOSAL PLAN

FISH REMOVAL

As many dead fish as is possible to collect will be removed from the tank for disposal; removing all dead fish may not be possible given the potential complexity (aquatic vegetation) of the treatment reach.

- **Timing:** In general fish removal will occur within 48 hours after the end of each individual treatment.
- **Rationale:** Dead fish will be removed within 48 hours after each treatment to reduce public concerns and perceptions associated with viewing dead fish.
- **Gear:** Dip nets, gloves, block nets, seines, and five gallon buckets will be used to remove dead fish.

FISH DISPOSAL

- **Methods:** Dead fish may be disposed of by:
    1. **Burying:** Fish will be buried onsite within the disturbed flood plain by burying and completely covering the dead fish with soil and rocks.
    2. **Collection:** Any carcasses needed for other purposes (research needs, etc.), will be removed from the system in sealed containers.

13. CRISIS MANAGEMENT PLAN

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

14. POST-TREATMENT MONITORING AND EVALUATION

POST TREATMENT (SHORT-TERM) ASSESSMENT

Following the completion of each treatment the following assessment steps will be conducted to determine the short-term success of the treatment.

- **Effectiveness of chemical application (i.e., distribution and deactivation of rotenone):** Water and soil samples will be taken no earlier than 24 hours after the end of the treatment activities. After 48 hours a survey of Soldier Mesa Tank will be conducted to evaluate the effectiveness of the treatment. Long term monitoring will occur annually to determine the effectiveness of stocking and ensure the integrity of piscicide treatment activities.
- **Public reentry to project area:** Public entry in based on the concentration of chemical used during the treatment per the Rotenone SOP Manual (Finlayson et al. 2010):

  For both lotic (flowing water) and lentic (standing water) applications of $\leq$0.09 ppm (90 ppb) active rotenone ($\leq$1.8 ppm 5% a.i. formulation), signs can be removed once application is complete. For standing water applications >0.09 ppm active rotenone (>1.8 ppm 5% a.i. formulation), signs can be removed following a 24-h bioassay demonstrating survival of bioassay fish, or when analytical chemistry shows $\leq$0.09 ppm active rotenone, or 14 days after the application is complete, whichever is less.

- **Recovery of baseline environmental conditions:** Recording of pretreatment baseline conditions of within the treatment reach was not planned because the treatment area is not managed for fish and is currently occupied by nonnative aquatic species (excluding

aquatic insects). Recolonization of the treatment area by aquatic insect species will be rapid due to the tanks proximity to other stock tanks in the area.

All personnel will be debriefed as soon as the treatment phase of the projects has been completed to identify problems, determine causes, and propose corrective measures for future treatments. Treatment crew will report to the treatment leads and this information will be reported to the treatment lead. This effort involves the assessment of chemical and biological monitoring data and review of notes and observations recorded during and immediately following the treatment.

ASSESS THE EFFECTIVENESS OF TREATMENT AND DEACTIVATION

The assessment of the effectiveness of the treatment and deactivation operations will enable project leaders to adjust plans based on the actual results. The effectiveness of these operations and related changes in operations will be monitored throughout the project.

The following metrics will be utilized to measure the effectiveness of the treatment:

- **Mortality and behavior of fish:** Fish behavior and mortalities will be recorded by crew during and after each treatment. Free swimming fish from the tank will be used as sentinel fish to assess the effectiveness of the treatment.
    - Fish behavior will be monitored during and after the treatment.
    - The crew members will observe and record the behavior of the sentinel fish and the overall progress of the treatment. This information will be communicated to the lead applicator.
    - General fish behavior will include:
        - Tipping – when fish begin to lose their equilibrium,
        - Gilling - when fish have lost equilibrium and respiration becomes difficult,
        - Death.
    - The times of the observed behaviors and the number of individuals observed displaying them will be recorded. Crew members will record the above mentioned behaviors of fish along the treatment reach. All information will be communicated to the lead applicator hourly and application rates will be adjusted accordingly..
- **Sampling for the presence of live fish immediately after each treatment:** The entire treatment reach will be surveyed for the presence of live fish with 48 hours after the end of the treatment. Bag and straight seines will be the primary method of surveys post treatment, dip nets and backpack electrofishing unit may be used.

WRITTEN CRITIQUE OF TREATMENT

The AGFD will prepare a written summation and critique of the treatment within 60 working days once the treatment has been completed. A meeting of all those involved in the treatment will be held at the end of each application to get consensus on what worked and what should have been done differently. Topics for the meeting include: if the plan was followed, what problems or issues were associated with the plan, and what improvements were needed. A draft of the written summation and critique will be sent to all personnel involved for review and consensus before completion of the final critique. When appropriate, the critique may be used to update policies and procedures.

POST TREATMENT (LONG-TERM) FISH MONITORING

Soldier Mesa Tank has been renovated to remove nonnative fish three times (2005, 2008, and 2009). Despite successful chemical treatments, illegal stocking activity has continued at the tank with nonnative fish currently present. Given the frequency of illegal stocking activity long term monitoring of Soldier Mesa Tank and other tanks within the Fossil Creek watershed are essential to preserving the integrity of the native fish community in Fossil Creek.

We propose the following steps to address these concerns:

- Work with U.S. Fish and Wildlife Service and AGFD nongame personnel to continue to monitor Soldier Mesa Tank and other Tanks within the Fossil Creek drainage to achieve early detection of illegal stocking activities. Annual surveys of the stock tanks within the Fossil Creek watershed will be conducted to assess current conditions.

- Work with AGFD law enforcement to educate the public about, and correct, the illegal stocking activities that continue to occur at stock tanks within the Fossil Creek Drainage.

- The AGFD will work with our cooperators in developing public outreach materials including signs to identify nonnative fish species. This information will include the appropriate contacts to report potential unwanted fish species. With approval from the Coconino National Forest illegal stocking signs will be placed at the tank(s) informing the public about illegal aquatic stockings and will include the AGFD Operation Game Thief (OGT) hotline.

Long-term Treatment Assessment Report

A long-term assessment report of the treatment will be provided 3 years post-treatment. The long-term assessment will include:

- Determination of the treatment effectiveness and benefits – Continued fish monitoring of the treatment area and upstream are planned to determine the effectiveness of the treatment and continue to monitor for nonnative species.

- Assessment of the public perception of the success of the project – continue to work with stake holders.

- An overall assessment of the project.

15. APPLICABLE LAWS AND REGULATIONS

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; updated August 27, 2013) for a complete list. Updated laws and regulations included:

- ARS Title 17, Article 5, 17-481.

16. AGFD ENVIRONMENTAL ASSESSMENT CHECKLIST

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

17. MEDIA RELEASE OF APPROVED ACTION

A media release of the proposed action along with description of the closure area will be released the week prior to the proposed treatment.

18. QUALIFIED REVIEWERS OF INTERMMEDIATE PLAN

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013) for a complete list of qualified reviewers.

19. ARIZONA GAME AND FISH COMMISION PETITION PROCESS

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

20. LITERATURE CITED

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

21. SIGNATURE PAGE

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).

22. APPENDIXES

See Fossil Creek Renovation Project Intermediate Planning and Public Involvement Proposal (September 6, 2012; amended August 27, 2013).